The W.A.S.P.

Vol. 54, no. 11 | Winner of the Astronomical League's 2021 Mabel Sterns Award | November 2022

The Warren Astronomical Society Publication

What a Star Party Season!

Great lakes Star Gaze

This star party is at the River Valley RV Park in Gladwin, MI

Location and dark skies are the main attraction of this star party. Gladwin, MI is a central location that provides excellent observing without traveling hours into Northern Michigan. This is a star party for the astronomer who loves to observe and mingle with other astronomers.

September 22 - September 25

Photo by Doug Bock

Okie-Tex Star Party

Camp Billy Joe
Kenton, OK

8 days of Bortle-1 skies, perfect for the best in observing, imaging and just enjoying the magnificence of our Cosmos.

Imaging Seminars, guest speakers, swap meets, vendors, good food and the friendliest star party you can attend.

September 23 - October 1

Photo by Adrian Bradley

The WASP

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Warren Astronomical Society, Inc.
P.O. Box 1505
Warren, Michigan 48090-1505

Dale Thieme, Editor

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The Warren Astronomical Society, Inc., is a local, non-profit organization of amateur astronomers. The Society holds meetings on the first Monday and third Thursday of each month, starting at 7:30 p.m.

First Monday meeting:
Cranbrook: Institute of Science
1221 North Woodward Ave
Bloomfield Hills, Michigan

Third Thursday meeting:
Macomb Community College
South campus, Bldg. J, Room J221
14600 Twelve Mile Rd.
Warren, Michigan

Membership and Annual Dues

Student	Individual	Senior Citizen	for families
$17.00	$30.00	$22.00	add $7.00

Astronomical League (optional)$7.50

Send membership applications and dues to the treasurer:
c/o Warren Astronomical Society, Inc.
P.O. Box 1505
Warren, Michigan 48090-1505

Pay at the meetings

Also via PayPal (send funds to treasurer@warrenastro.org)

Among the many benefits of membership are
Loaner telescopes (with deposit). See 2nd VP.
Free copy of each WASP newsletter.
Free use of Stargate Observatory.
Special interest subgroups. See chairpersons.

The Warren Astronomical Society Publication (WASP) is the official monthly publication of the Society.

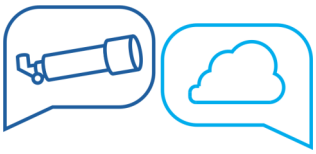
Articles for inclusion in the WASP are strongly encouraged and should be submitted to the editor on or before the end of each month. Any format of submission is accepted. Materials can either be transmitted in person, via US Mail, or by email (publications@warrenastro.org)

Disclaimer: The articles presented herein represent the opinion of their authors and are not necessarily the opinion of the Warren Astronomical Society or this editor. The WASP reserves the right to edit or deny publication of any submission.

Stargate Observatory is owned and operated by the Society. Located on the grounds of Camp Rotary on 29 Mile Road, 1.8 miles east of Romeo Plank Road, Stargate features an 8-inch refractor telescope under a steel dome. The observatory is open according to the open house schedule published by the 2nd VP.

Snack Volunteer Schedule

The Snack Volunteer program is suspended for the duration. When it resumes, volunteers already on the list will be notified by email.



Discussion Group Meeting

Come [illegible] nomy, space news,

CANCELLED THIS MONTH

In This Issue:

Want to keep track of W.A.S. meetings and exciting astronomical events next year?

Order your 2023 Warren Astronomical Society calendar now!

These beautiful calendars feature W.A.S. member astrophotography photos, including:

- Bill Beers - M33 - Triangulum Galaxy
- Bob Berta - Pelican Nebula
- Doug Bock - IC434 - Horsehead Nebula
- GM Ross - Aurora from Pellston, MI in 1982
- Dale Hollenbaugh - Saturn
- Jeff Charles - Moon Craters
- Ken Heilig - Ready for solar observing outreach
- Gary Klein - Geminid Meteor Streak
- Ken Meloche - M42 - Orion Nebula

Two Ways to get Your Calendar

1 If you can pick up your calendar at a Cranbrook meeting, you can pre-order on PayPal or pay by check or cash at the meeting for $20 each (email publications@warrenastro.org beforehand that you are getting a calendar so we know how many are available).

The button below will take you to the PayPal payment page.

Buy now
Pick up at meeting

2 If you need your calendars mailed, then the cost is $20 + $5 flat rate shipping per order (regardless the calendar count) via PayPal or by sending a check to Treasurer, Warren Astronomical Society, PO Box 1505, Warren MI, 48090 (Again, email publications@warrenastro.org ahead of time.) Be sure to include your mailing address so we can get them to you.

Use the button below, shipping is added when you check out.

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President's Field of View

It's now the time of year when the "water" constellations rise out of Lake Huron at my favored observing spot on the Sunrise Side of Michigan. Aquarius, Pisces, and Cetus all have their season while Piscis Austrinus lurks along the southern horizon. These are constellations I can hardly even see from my home in Dearborn, where the combined light pollution of residential and commercial excess and the perpetual daylight of industry wash out anything below second magnitude on a typical night and below third magnitude on the best moonless nights. Only lovely Fomalhaut punches through the light dome, joining the stars of the Summer Triangle as they slide away and the Winter Hexagon as they ascend.

There is a spot in Metro Detroit, accessible to amateur astronomers, where the southern skies are remarkably good, and that's the Hector J. Robinson Observatory as maintained by our comrades at the Ford Amateur Astronomy Club. And that, friends, brings me to the recent sudden and shocking death of the FAAC's Greg Knekleian, former editor of their newsletter and frequent volunteer at the HJRO. Greg passed away following a car accident last week, and in breaking the news to us, member Sandra Macika included some photos, saying, "These are some pix of Greg and I at the Hector J. Robinson Observatory (HJRO) that he loved so much."

That's how the names get handed down here in our little slice of the world, like the names on our awards: John Searles, who logged the miles to make W.A.S. meetings until his own tragic early demise. Blaine McCullough, who revitalized Stargate Open Houses by going out there in fair weather and foul in case someone else showed up. Bob Watt, always ready to pick up a tool and to offer friendly advice to newcomers. Larry Kalinowski, an indispensable man up until the W.A.S had to learn how to get along without him. As the Board sorts through nominations for this year's service awards, those names and legacies loom large even as fewer and fewer active club members have actual memory of the men for whom each award is named.

It's a strange sort of weight to carry every year, and glad I'll be to hand it off now that I am, as my former Board colleague Dr. Dale Partin joked recently, "terminal." That's term-limited, not ill, mind you, and also a strange state to be in as the wheels of W.A.S. processes and procedures hum along. Raise a glass, I suppose.

In Memoriam

Greg Knekleian

1961 - 2022

Tragically, we learned last month of the loss to the astronomical community of Greg Knekleian, member of the Ford Amateur Astronomy Club and friend of many of our WAS members.

Letters

2nd to last letter to award winning W.A.S.P.

Given negative experiences in recent years at a star party which I will not mention, a pathological hatred of **Red Dot Finders** and **Tel-Rads** has gripped me. This summer I wished all in the world could be assembled in a big pile, set a-fire, then crushed with a bulldozer. I would help start the conflagration, given decades' experience at Kissing Rock Farm astronomical "Yule Burns". Not only would I never use those instruments, my confessor advised not to look upon them, i.e. throw a cloth over if no other telescope available.

But I am a reasonable man. As brainless as Red Dots are, possibly use as a fall-back. Two years ago I inherited a refractor from an astronomical society which ought not be mentioned. It had/ has no finderscope. Of course it has no "push to" or "go to", lacunae which would daunt a lesser fellow.

May be a Red Dot would help, but only if some generous soul would give me one . . . for nada. I would never use it in public, though.

G. M. R., Observers' Observer.

Observing Reports

1 October

The Sun. Four groups, 3 in N. hemisphere. Two groups have one spot a-piece, but In north hemis. old crossing group ~ 16 spots with a primary + umbra. Coming over E. limb is large, heavily populated group.

The Moon. One d. before 1st quarter. and very close to greatest S. Declination, -27 deg. 25 min. In eastern Scorpius. Maurolycus very prominant on terminator with hint of floor detail. Barocius to immed. S. probably visible too.

Transparency good-excellent. Seeing poor.

5-cm f /11 refractor, as before. 7X binoculars.

1 - 2 October.

Jupiter. Now past opposition. Callisto vis. to E. of planet, all though not at greatest elongation. Other satellite, Europa or Ganymede very close to ball, but glare prevented good identification.

Transparency good.

7X35 binoculars

3 October

The Sun. 4 groups distributed over disc. Two groups, N. and S., hint of bi-polarity in spot distribution. Huge formation moving on, extended in longitude and very many spots concentrated @ centre.

Transparency excellent, seeing good.

5-cm f /11 refractor as before.

4 October

The Sun. Four groups, one in S. hemis. Previously described very large group in north hemis. with very numerous spots, most little more than "pores". At centre is large penumbral blossom containing six umbrae. Entire north hemisphere = wide distribution of groups.

Transparency good. Seeing fair.

5-cm. refractor as before.

4-5 October

The problem of **SY Eridani**. (Very close to Cursa.) Observed in the "8s". Per memory through years, all ways in 8-9 mag. But -- Assoc. of Var. Star Ob's charts denote 10.4 - 11.4, photographic. Semi-regular, Spectrum C6.

Transparency poor (cirrus).

16" f /10 Schm. - Cass. 100X

COMMENTARY: C class = "carbon", very "late" spectrum. Photographic plates tradit. blue sensitive. "P" mag. might have been established long ago. A red star magnitude would be under-estimated. Observer will not contend with technical staff again on accuracy of brightness.

6 - 7 October

Tau Aquarii (R3349). 4.1 magnitude. Lunar occultation, waxing gibbous. Possible graze @ S. polar area. Under obs'n for 11 min. No event.

Transparency good (w/ clouds)

4" f /10 refractor. 120X

COMMENTARY: Two events on card, both place star at std. 3 km. peak: 0.0 arc-seconds.

10 October

The Sun. Three groups, two well endowed. Both large groups with principal spots display one with multiple umbrae in penumbral setting. Previously described very large group in N. hemis. set to go over limb in 3 days?

Transparency fair, seeing fair.

5-cm. refractor, as before.

.....

COMMENTARY: No surprise to see above-mentioned group re-emerge.

10 - 11 October.

Jupiter. Io and Europa formed "cat's eyes" to E. of ball, so close one might expect occultation(s). Initially difficult to make out small features on disc, same indistinct N. polar "hood". In time, Great Red Spot seen, just west of C.M. Orange-red, but small feature approaching round.

The Moon. The ~ 120 deg. split rays from Proclus to create Palus Somnii well known, but examination of the shore of Mare Crisium = 3rd ray at +/ - 120 degrees. Trifid of rays. To north the central ridge in Cleomedes obvious in nearly setting light angle. A fault?

Transparency poor. Seeing fair.

16" f /10 S.-C. @ 200X

.....

COMMENTARY: Appearance of G.R.S. reminds of a drawing from late 17th c.

Essentially round. Compare to 19th c. max of 41,000 km. in longitude ca. 1878 per *LAROUSSE ENCY*. (1958) "bright red". Likely composite from 1930's, shows large oval of faint pink. Plate IV.

21 October

The Sun. Two very small S. hemisphere groups. Larg-

(Continued on page 6)

(Continued from page 5)

est with ~ 5 spots.

Transparency good, seeing fair (wind).

5-cm. refractor with sub-dia. mylar filter, 45X

22 - 23 October

The problem of RX Sge. On Var. Star Assn. "d" scale chart (2021) comparison stars 12.4, 12.6 do not match vis. impression. Possible reversal of magnitudes? RX duly logged in between: 12.5. Confirmed by "Handsome Joe" McBride and William "Master of the Table".

Zodiacal light. Not visible before twilight

10" Newtonian + naked eye.

Transparency excellent, then fair (smoke?), seeing good.

COMMENTARY. Given vast number of var. stars under study and research demands to make charts current, plotting errors or out of date mags. to be expected. Observer and McB. have communicated with h. q. recent years on potential problems, to date resolved w/o revision.

28 October

The Sun. Two groups, one very fore-shortened nearing W. limb, seems small but with at least dozen small spots and pores. Other in mid-disc, a primate spot to the W. with penumbra + ~ 9 small/very small spots well separated from it.

Transparency excellent. Seeing fair.

5-cm. f /11 refractor @ 45X, mylar filter.

.....

COMMENTARY: Bland photospheric activity seems out of place given rise of this Activity Cycle.

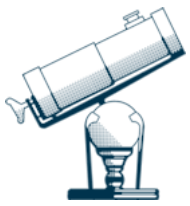
28 - 29 October

CZ Orionis. In out-burst and easily visible, "despite". The problem of AY Eridani. Constellation getting low but found w/o difficulty. Var. Star Assn. "d" scale chart totally inadequate: not enough faint comp. stars. Forced to extrapolate (poorly) from near-by star field.

Transparency fair from occasional high stratus.

16-in. f /10 Borr II @ Veen Obs'y. Various mags.

COMMENTARY: CZ activity not rare, but the earlier in observing season, the better. AY comparison star scarcity likely from lack of primary data at h.q. or obligations for revision work else-where.



The Election Day Total Lunar Eclipse

November 8th, 2022

Timothy Skonieczny
Professor of Physics and Astronomy
Macomb Community College
Warren, Michigan

A lunar eclipse occurs when a full moon passes into the shadow of the earth. This does not happen every month even though there is typically one full moon every month because the moon's orbit is inclined to the earth's orbit around the sun by a small angle of 5°. This causes the moon to normally pass above or below the earth's shadow. If the moon passes directly into the dark shadow of the earth, called the umbra, the eclipse is referred to as a total lunar eclipse. A person standing on the moon would experience a total eclipse of the sun. There is an outer and fainter shadow called the penumbra. In this case, a person standing on the moon would experience a partial eclipse of the sun.

Compared to a total eclipse of the sun, which is visible over a narrow path, total lunar eclipses are more commonly seen. This is because anyone viewing from the side of the earth facing the moon in clear weather can observe it. While the next total solar eclipse is not visible from this area until September 12th, 2444, four total eclipses of the moon can be seen locally over the next decade. Unfortunately, there are two circumstances that make this eclipse less than ideal. One is that the maximum eclipse occurs at 5:59 a.m. while the moon is setting low in the west and the other is that weather prospects in November are not promising. Historically on this date, only about 40% of days have been totally or mostly clear. The next total lunar eclipse seen from this area occurs on March 14th, 2025. It is another early morning eclipse and the weather prospects are actually worse, so it is worth the effort to try to observe this one.

The eclipse begins at 3:02 a.m., but the most exciting time to observe is when the moon is close to entering the total phase at about 5:00 a.m. This eclipse is not predicted to be as dark as others since the moon passes just north of the center of the earth's shadow. On the plus side, the dramatic color changes will be more vividly seen.

Optical aid is not required to view the eclipse, but a pair of binoculars or a small wide-field telescope will enhance the view. It will not only make the moon appear larger and sharper, but the extra light gathering power will make the colors appear more vibrant compared to the view by the unaided eye.

If you are interested in imaging the eclipse, a cellphone camera usually produces a poor image be-

(Continued on page 8)

From earlier this year, a sequential composite of the lunar eclipse by Rik Hill

(Continued from page 7)
cause of the small size of the moon and its low surface brightness during totality. A single lens reflex camera with a long telephoto lens of at least 300 mm focal length is needed for good results.

3:02 a.m. The moon enters the penumbra of the earth's shadow. This is a faint shadow in which a person standing on the moon in this shadow would experience the sun only partly covered. It cannot be detected visually, but technically marks the start of the eclipse. Over the next 67 minutes, the moon moves deeper into this shadow. By 3:30 a.m., the shadow should be detectable on the upper left corner of the moon. It will be 1/3rd of the way up the sky in the WSW.

4:09 a.m. The partial eclipse begins. The moon now enters the dark umbra of the earth's shadow. A person standing in this shadow would see the sun completely covered. For the next 67 minutes, more and more of the moon is covered. The shadow is round, which is one reason why ancient astronomers believed that the earth is spherical in shape. It also has a fuzzy edge due to the atmosphere of the earth. By 5:00 a.m., the darkest portion of the moon will have noticeable coloring to it.

5:16 a.m. The total eclipse begins. The moon is now completely immersed in the earth's umbra. No portion of the moon experiences direct sunlight. But the moon does not disappear from view because longer wavelengths of light are refracted by the earth's atmosphere and illuminate the moon with a reddish-orangish light that can make the moon quite beautiful. The upper portion of the moon will appear noticeably brighter than the lower portion because it is farther from the center of the earth's shadow. This phase of the eclipse is best viewed far from city lights when the disk of the moon can be seen against a dark starry background.

At the beginning and ending of the total phase, a bluish tinge can be seen if viewed with binoculars or a small telescope. This is caused by sunlight refracting through the ozone layer of the earth's atmosphere and is the only time in which the ozone layer can be easily seen by humans.

5:38 a.m. Astronomical twilight begins. The sky will begin to brighten in the SE opposite the direction of the moon. The sun is approaching the horizon. It is now easy to imagine the alignment of the sun-earth-moon that is necessary to cause this phenomenon.

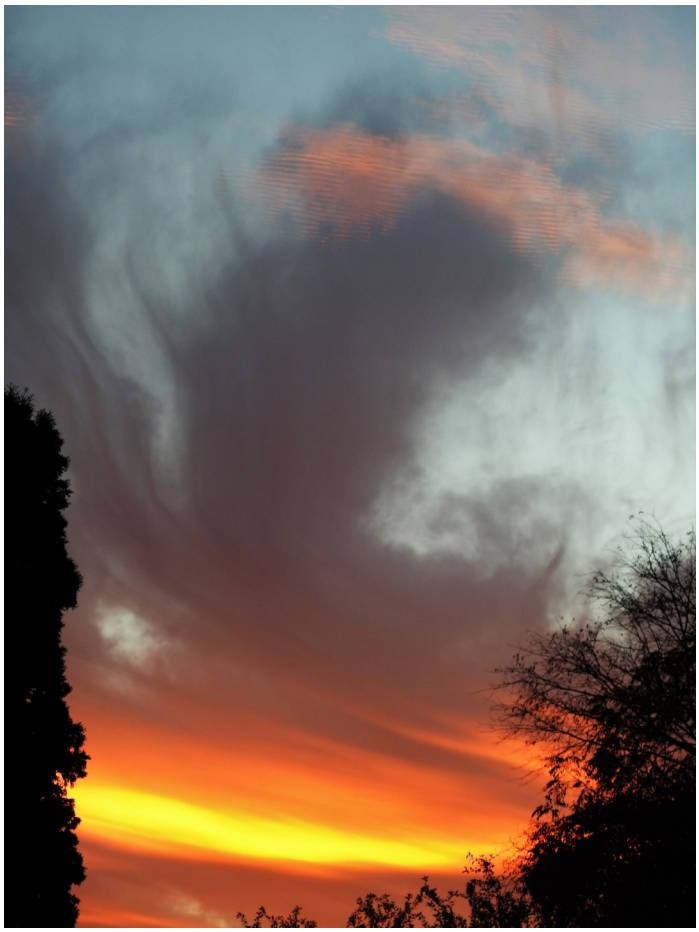
5:59 a.m. Maximum eclipse. This is when the moon lies deepest in the earth's shadow and will appear at its faintest. The phases of the eclipse will now reverse order. The moon is now only 13° high in the west, so an unobstructed horizon is essential to see it. That is about the width of one's hand, held at arm's length above the horizon.

6:41 a.m. The total eclipse ends.

7:14 a.m. Sunrise

This year also provides a rare opportunity to see the moon pass directly over a bright planet. On the evening of December 7th, the moon occults, or passes over, the planet Mars at about the same time Mars is at opposition. This occurs when Mars is closest to the earth and appears brightest. Seeing the full moon occult Mars will be a striking site. The occultation begins at 10:21 p.m. and lasts for about 48 minutes.

On October 14, 2023, a partial eclipse of the sun will be visible from this area. That will be a prelude to the total solar eclipse on April 8th, 2024, that can be seen as close as Toledo, Ohio. Nature is giving us some remarkable celestial events over the next two years!



An Oddly Beautiful Sunrise

Date Taken: 10/25/22

Photographer: Ray Bosshard

Another Month, Another Puzzle

In the October 2022 issue of the W.A.S.P., readers were invited to ID the features in the lunar image Rick Gossett posted. Rick was inspired to get another lunar image and invite us to ID the craters, but this time provide the answer elsewhere in the issue.

The challenge here is to ID the three craters, more or less connected, in the middle-left to center, and a feature lurking in the shadows. Answer on page 36.

A Tale of Two Star Parties

A comparison of Michigan and Oklahoma Skies

The difference in the light that gets through our skies makes the DSO images you all produce here in Michigan all that more spectacular. With more light pollution to contend with, it takes a lot more time to gather the same amount of data.

Here are two shots. One from Lake Hudson Dark Sky Preserve (above), in the Picnic area looking through the trees that partially obscure the lake. The other photo (below) was a 'for grins' photo I took at Okie Tex with a cloudy sky and someone blasting red light, but the same Scutum area of the Milky Way visible.

The dust lanes of the Milky Way are just not as visible in the sky at Lake Hudson as they are in Bortle 1/2. I believe it's the added visibility of dust lanes that makes the Milky Way look 'different'. As you go up to the UP, those dust lanes become more visible but not *quite* up to the level that it looks in a drier climate that's a few thousand feet above sea level.

Both images were taken with the same amount of time for the sky (2 mins). Tracking was slightly better back at Okie Tex than I had when I took the shot at Lake Hudson. I could have been more careful about that.

Memories of Star Party Season

Part One: Great Lakes Star Gaze

The 2022 twentieth GLSG star party wase held Thursday, September 22 through Sunday, September 25, 2022. This year they celebrated their twentieth anniversary!

Gladwin, MI is a central location that provides excellent observing without traveling hours into Northern Michigan. Limiting magnitudes are estimated to be around 6.5 at . This is a star party for the astronomer who loves to observe and mingle with other astronomers.

Above: Dennis Schmalzel, Andy Weeks, Joe Lewandowski, and Bill Beers.

For your future planning, the 2023 star party is tentatively scheduled for September 14-17, 2023.

Above: The "Bottom Feeders" group was out in force.

Below: When not star-gazing, attendees were treated to lectures and demonstrations, in this case, how to make a comet.

Photos by Doug Bock

Memories of Star Party Season

Part Two: Okie-Tex Star Party

"8 days of Bortle-1 skies, perfect for the best in observing, imaging and just enjoying the magnificence of our Cosmos.

Imaging Seminars, guest speakers, swap meets, vendors, good food and the friendliest star party you can attend." Says the invite to the star party located in Kenton, OK at Camp Billy Joe.

Above: A familiar vendor at the star party.

Right: Not to mention...a bit of fun.

Below right: Not quite Bortle-1, but we're getting there...

All images by Adrian Bradley

Bottom left: ...Ah, there we are!

This is the Summer Triangle Region over the Mesa.

The View From C.W. Sirius Observatory

NGC 7293 (Helix Nebula)

The **Helix Nebula**, also known as **NGC 7293**, is a planetary nebula located in the constellation Aquarius. Discovered by Karl Ludwig Harding, probably before 1824, this object is one of the closest to the Earth of all the bright planetary nebulae. The distance from Earth is approximately 655 light-years. It is similar in appearance to the Cat's Eye Nebula and the Ring Nebula, whose size, age, and physical characteristics are similar to the Dumbbell Nebula, varying only in its relative proximity and the appearance from the equatorial viewing angle. The Helix Nebula has sometimes been referred to as the "Eye of God" in pop culture.

The Helix Nebula is an example of a planetary nebula, formed by an intermediate to low-mass star, which sheds its outer layers near the end of its evolution. Gases from the star in the surrounding space appear, from our vantage point, as if we are looking down a helix structure. The remnant central stellar core, known as the central star of the planetary nebula, is destined to become a white dwarf star. The observed glow of the central star is so energetic that it causes the previously expelled gases to brightly fluoresce.

When viewing the Helix through a smaller aperture telescope, try using averted vision (directing your gaze to one side of the nebula). Using a telescope 10" and larger will really enhance the structure. Adding an OIII or an Ultra High Contrast filter to your eyepiece in a very large telescope, >14", sometimes helps.

Image: Bill Beers

About CW Sirius Observatory:

C.W. (Cadillac West) Sirius Observatory is located 15 west of Cadillac Michigan. Owned and operated by WAS member Bill Beers. The dome is an 8' Clear Skies Inc dome which houses an 11" f/10 SCT telescope, a 102mm f/7 refractor telescope, Celestron CGEM DX mount, and uses an ASI ZWO 071 color CMOS camera, as well as a QHY8L color CCD camera. The telescope can be remotely operated from inside Bills house.

Anyone interested in learning about astrophotography, or any questions regarding equipment, or how to take astrophotos using your iPhones, or any related questions, can contact Bill at: BEEZOLL@AOL.COM

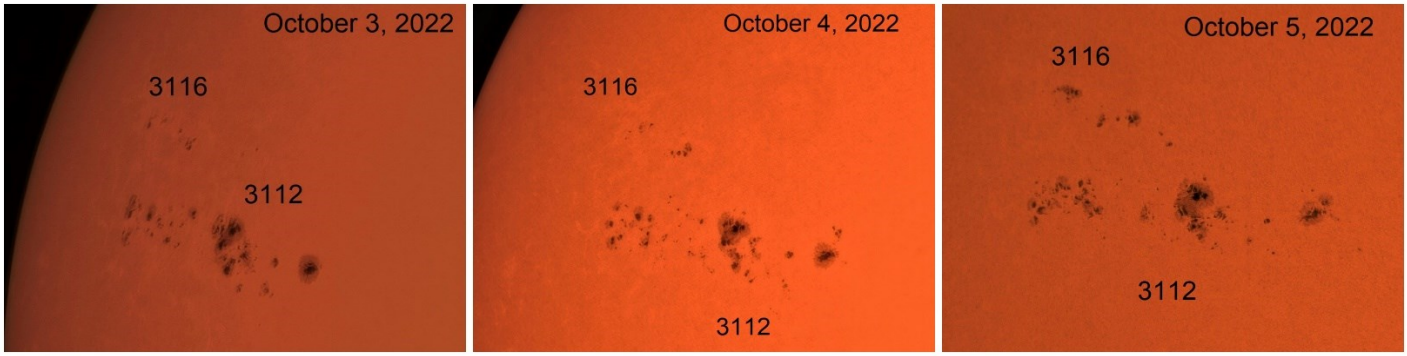
At the beginning of October, we had a lot of clear weather. I decided to work on the sun since it had some large groups of sunspots on the surface.

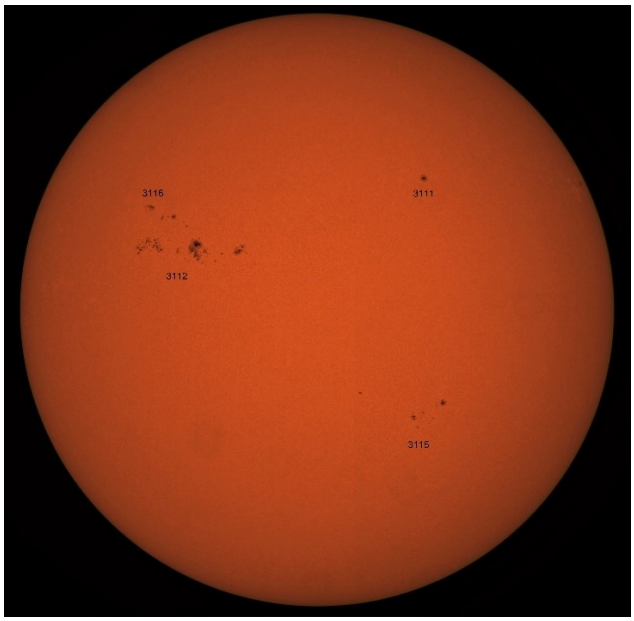
These three images were taken one day apart, October 3, 4 and 5, 2022. Note the rotation of the groupings from one day to the next. As you can see the first day it was near the edge and over the next two days rotated towards the middle of the sun. The last image shows all the spots on October 5, 2022

Using a 6" f/10 SCT with a white light filter and with the ZWO asi2600MC PRO camera at prime focus, I took several 60 second videos of raw data. Once collected, I processed them using Autostakkert3 to stack the best 10% of the frames. This is done so we collect the seconds of good seeing to improve the quality of the final image.

My processing varied a bit with me brightening up the picture in the middle a bit. This may or may not make the spots a little more pronounced. I've highlighted the 2 groups.

If you have solar filters for your equipment or an actual solar scope, you might consider checking out the sun this year as the activity increases through its cycle.





Celestron 6" f/10 SCT with the ZWO asi2600MC PRO camera, White Light filter.

-Doug Bock

Notes from the Apache-Sitgreaves Observatory

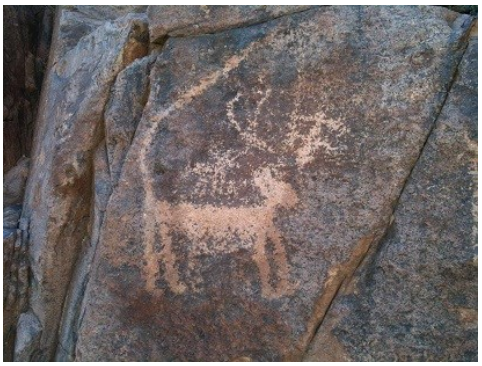
Sometimes, an observatory is not just taking data to forward science, or just working on a system or widget to forward science.. Sometimes, an observatory is marketing itself, its assets —to pay for forwarding science, and education.

I founded the Apache-Sitgreaves Research Center, Inc. (ASRC), in Arizona (The Articles of Incorporation state: Ground-based space research and education) and opened the 36" telescope up to the public. For that, a number of years later, the astronomers at Mt. Lemmon honored me by naming an asteroid after me; 152533 Aggas. They thought the Apache-Sitgreaves Research Center and Observatory was worthwhile, noteworthy.

ASRC, is financed from what it brings in, and I finance the rest because I think it is a worthwhile cause with the good it does educating everyone using a very big telescope under very dark skies.

I have donated my Nightscape, Wildlife, and, Weather images to benefit ASRC.
Available on canvas wrap, in various sizes, and your help is appreciated when you buy one or two at typical Wall Art prices.
And in return, you get a very nice picture to hang on your wall knowing you helped a good cause..
The Holidays are upon us.
Do you, or you for a friend or family member of yours, want to help with this challenge?

ASRC's challenge —is to be self-supportive. I have donated my money, my time, my images, my books (future tense for books), to give ASRC the best opportunity to succeed.
Can you help a good cause and help what ASRC is doing?
The initial artwork pictures are stunning. I have more to upload…
The defining item of ASRC is that; I designed, and built this 36" scope, what is considered the largest Public Observing Telescope —in the entire State of Arizona (something Mt Lemmon removed from their website within a year of Apache-Sitgreaves Observatory opened to the public.



Through blood, sweat, and tears (I've got scars. There is blood on the ground here and under the Urethane).

If you could, please buy a picture, a Telrad heater, (eventually a book). The Apache-Sitgreaves Research Center and Observatory could use the help and you would have my gratitude. www.apache-sitgreaves.org

About the Apache-Sitgreaves Observatory

The Apache-Sitgreaves Observatory is located on the eastern edge of Overgaard, Arizona, a small town at just under 7000-foot elevation bordering the Apache-Sitgreaves National Forest in northern Arizona. The main telescope at ASO is a 36"f/4.5 Newtonian on a computer-controlled Alt-Az mount. Viewing through the 36" telescope is available to the public by appointment, as are the DSLR Workshop and Solar programs. Current astronomical research projects include the Supernovae Search Patrol of Abell Galaxy Clusters using short integrations reaching 18+ magnitude. ASO is operated by the Apache-Sitgreaves Research Center Inc. which is owned by WAS member, and former WAS president, Steven Aggas.

An Invitation:

ASTROPHOTOGRAPHY Special Interest Group

2022-2023 Meeting Schedule

Date/Time/Location	Topic
November 18 8:00 pm/ WMU Rood Hall	***Imaging Mars ... LIVE!*** *presented via Zoom by* Agapios Elia
December 16 8:00 pm/ WMU Rood Hall	***Everything You Need to Know about Flats*** *presented by* Pete Mumbower
January 20 8:00 pm/ WMU Rood Hall	***Capturing the Solar Cycle*** *presented via Zoom by* Jack Newton
February 17 8:00 pm/ WMU Rood Hall	***Automated Imaging with NINA: Features that Make it a Killer App*** *presented by* Lloyd Simons
March 17 8:00 pm/ WMU Rood Hall	***Night Sky Photography: From Capture to Post-Processing*** *presented by* Zolt Levay

All AP-SIG *meetings are also live-streamed on Zoom.*
Please see our website for registration information.

Kalamazoo Astronomical Society
— www.kasonline.org —

Directions to Rood Hall ...

Rood Hall is located on the main campus of Western Michigan University at 210 I Wilbur Avenue. From Stadium Drive, travel northwest on Howard Street. Turn right on West Michigan Avenue, then take the second exit from the roundabout to Ring Road South.

Parking is free in Lot 61, the employee parking lot outside of Everett Tower and Rood Hall, after 6pm on Fridays. Unless noted otherwise, all meetings will be held in room 1110. Use the entrance located under the bridge between Everett Tower and Rood Hall.

Rood Hall doors will be unlocked for entry at 7:30 pm. They will automatically lock at 8:30 pm. After that, entry will not be possible.

Meeting days, times and locations may vary, please always check our website before attending a meeting.

Presentations

Monday, November 7, 2022

Presentations

Main Talk:

By Tim Campbell

We learn much about the universe from light coming in our telescopes. Breaking down that light tells us much more, including the light we don't see- infrared. Tim covers advances in Spectrography and new advances with the JWST.

About the speaker:

Tim Campbell has been interested in astronomy for as long as he can remember, but became completely hooked after observing Saturn's rings through a telescope when he was 19 years old.

He is also a member of the Ford Astronomy Club since 2011, enjoys public outreach, and is a planetarium presenter/operator at Henry Ford College.

No longer satisfied to merely enjoy viewing objects of the night sky, his interests & passions have steered toward understanding the physics of the cosmos.

Officer Elections:

Presided by Ken Bertin

Candidates:

President.....(open)
1st VP .....Bob Trembley
2nd VP.....(open)
Treasurer .....Adrian Bradley
Secretary.....Mark Kedzior
Outreach .....Kevin McLaughlin
Publications .....Dale Thieme

Thursday, November 17, 2022

Virtual Presentation

Feature:

By Danica Remy

In this session, Danica will describe the functions of the B612 Foundation and the research going into the defense of our planet from asteroids. The DART mission is sure to get a mention.

About the Speaker:

Danica is President and chief executive of B612 Foundation, which leads the private sector efforts in research, analysis, and systems design to protect Earth from asteroids.

Danica also co-founded the international program Asteroid Day along with legendary Queen guitarist Dr. Brian May; Apollo 9 astronaut and B612 Foundation co-founder Rusty Schweickart; and German filmmaker Grigorij Richters. Asteroid Day is supported by the Government of Luxembourg and international space agencies, and in 2016 the United Nations sanctioned it as an official day to increase global awareness of asteroids.

WAS PRESENTATIONS

If you would like to present either a short talk (10-15 minutes) or a full-length talk (45-60 minutes) at a future meeting, please email Bob Trembley at:

firstvp@warrenastro.org.

Goodbye, Wendee.

Dear readers,

What follows is the most difficult article I have ever written. On Friday, September 23, 2022, my wife Wendee died. She had been suffering from metastatic breast cancer for over a decade, but this past summer she was truly and clearly suffering. We had an oncologist who was good clinically but who had no bedside manner, and a nurse practitioner who was very good, but a bit of a Pollyanna. Therefore, when Wendee began to destabilize by the hour near the end of September, I was just not prepared for it.

Wendee and I were together for more than thirty years, and we were married for the last 25 of them. We got together as the result of a fix-up. When Wendee's Mom, Annette Wallach, and my Mom, Edith Pailet Levy, resumed their childhood friendship in 1985, my father has just died from Alzheimer's Disease. They got together in Montreal and immediately shared stories about their children. Wendee, it turned out, had just separated from her first husband and I was long since divorced from my "practice wife." They decided to try to bring us together. Wendee was the first to reject the idea: "I am a dog person; he is a cat person," she said; "I am an athlete, and he is a couch potato." (I could say that over time I became a dog person and Wendee became a couch potato, but I won't.)

I just ignored my Mom's suggestion. Every year, or two, Mom would repeat her idea. After seven years, Mom asked again, and when I still had not done anything, she annoyingly chastised me and said, "forget the whole thing. Forget I ever asked you." That was a challenge. On March 23, 1992 (one year to the day before I took the two photographs that led to the discovery of Comet Shoemaker-Levy 9 that would strike Jupiter in 1994) I typed out a post card to her in Las Cruces. She replied and we finally met that summer. After lunch and a conversation with her and her two sisters, I returned to Clyde and Patsy Tombaugh's house, where I was staying. When Patsy answered the door she asked, "Well, how did your date go?" I looked at her and replied, "Patsy, I have just spent time with the three most beautiful women I have ever met!"

Early in our relationship, we were driving near Las Cruces. It was a clear dark night and we got out of the car. Wendee looked up and asked me, "What star is that?"

"That bright star," I answered her, "is Vega." Just then Wendee recalled that her first husband, long since divorced, had warned her that he would never answer her questions more than once. Wendee then inquired of me, "David, if I were to ask you every night, looking at that same star, the same question, 'What star is that?' what would you do?"

"I would explain to you, every night," I replied, "that star is Vega. "And I would never, ever, tire of it."

On another evening I was driving Clyde and Patsy Tombaugh back from a dinner engagement." Clyde was sitting up front with me, and Wendee was in the back seat with Patsy. "Clyde, I am going to take you home first and then I will take Wendee home."

"David," why not just drop Wendee off on the way? It would be faster."

Wendee and Dave's first telescope, Echo, in 1996

(Continued on page 20)

(Continued from page 19)

"Clyde I may want to hug her and give her a big kiss."

"That's okay. We'll wait!"

The group in the car got silent. I looked back towards Wendee, then to Clyde, and I said, "Clyde, I am taking you and Patsy home first." As Wendee and Patsy giggled in the back seat, Clyde said, "OK. Now that you explain it!"

Wendee and I were married in the Flandrau Science Center on March 23 (that magic date again) 1997. The reception at our home featured Comet Hale-Bopp and a lunar eclipse. Our first few months were difficult. Gene Shoemaker was killed in a car accident in Australia that July, and I had two cancer surgeries (prostate and right kidney) later that year. But as I recovered, our marriage became fun and interesting. We travelled everywhere. Possibly her favorite trip was to the outback near Alice Springs, where we observed over two thousand meteors on a single night in November 2001. Because for a short period we saw one meteor per second, I considered the Leonids that year a meteor storm.

We took three trips to Israel together, the last two of which were part of my doctoral work at the Hebrew University on the night sky in Shakespeare's time. I loved that particular period in my life, and Wendee and I had a lot of fun navigating the multitude of rules and regulations that the University appeared to make up as we went along. Near the end of that process, I wrote a routine question about the dimensions of the European paper I needed to use. The next morning I found Wendee looking at her email. "I need for you to read this message now," she said. "Is it good news?"

"I do think so." The letter was from the Hebrew University, announcing that the University Senate had just awarded my Ph. D. and that they hoped we would come to Israel to receive the degree in person. We spent the remainder of that happy day making flight arrangements.

Wendee served as director of our Jarnac Observatory, and I served as her assistant. I used it every clear night. During the 26 years we lived in our Vail home, I discovered only one comet, in 2006. The comet was confirmed by the Central Bureau for Astronomical Telegrams just as we returned home from the Yom Kippur services. I was so overwhelmed by the message that I printed it, and then without a word, cried as I walked back to the house and showed it to Wendee.

Wendee's greatest joy was not so much me, but our daughter Nanette and our grandchildren Summer and Matthew. One night, when she was a college student, our granddaughter Summer contacted us to inquire of a bright red star she noticed high in the southern sky. What followed was a wonderful conversation about Mars, Percival Lowell, and the possibilities of life somewhere on that distant world. Our grandson Matthew provided us with golden opportunities to show how, when he looks at the stars, he can escape the chatter of the nightly news and appreciate the big picture of the night sky and the Universe at our doorstep.

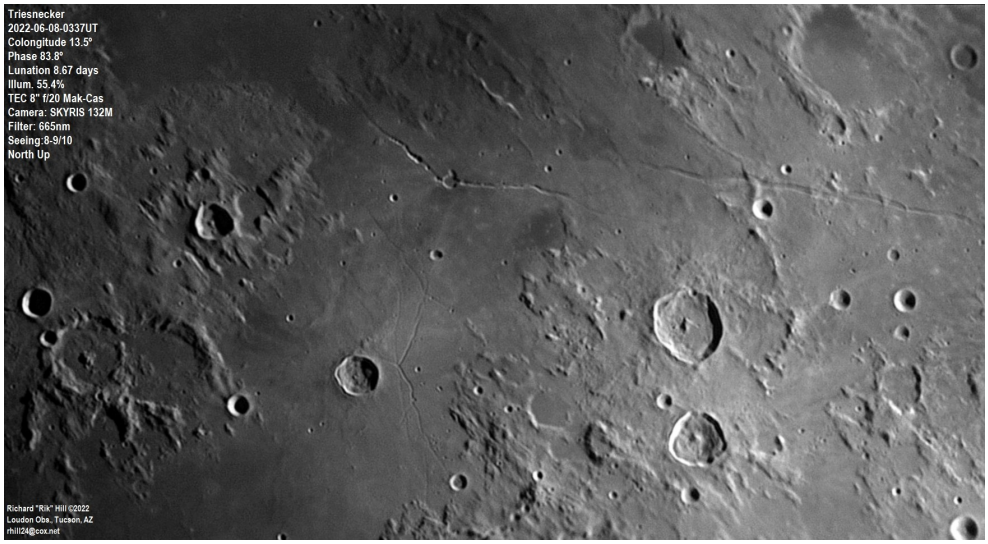
Our marriage gave me an opening to write some books, but my favorite book began when one morning I found Wendee reading intently. "You never told me you wrote a book about your dog when you were ten years old." She found that crazy old book the most delightful she had seen, and she wanted me to revise it.

By this time, around 2013, she had received her diagnosis of breast cancer. For years she did very well, until the end of last summer when she needed surgery to remove her ovaries. After that she began chemotherapy, which worked for a few months.

By the spring of 2022 all the treatments stopped working. Wendee insisted that I go to this year's Adirondack Astronomy Retreat, but she was obviously suffering. We made a 911 call in mid-September, and a second one two weeks later. In between I presented her with the first copy of Clipper, my new book for children. She was able briefly to hold it up and examine the front and back covers. With that second 911, I was pretty certain she would never be coming home. Wendee died on Friday evening, September 23. She was 73 years old.

The night before her funeral, our son-in-law Mark, our grandson Matthew, and I were enjoying an evening in the observatory. Matthew saw a bright meteor, and as I questioned him on its direction, I saw a faint one. Mark saw a third meteor. I like to think that this minor outburst of the October Cygnid meteor shower – three meteors within a period of about 5 minutes – were Wendee's goodbye. Rest in peace, my sweet Wendee.

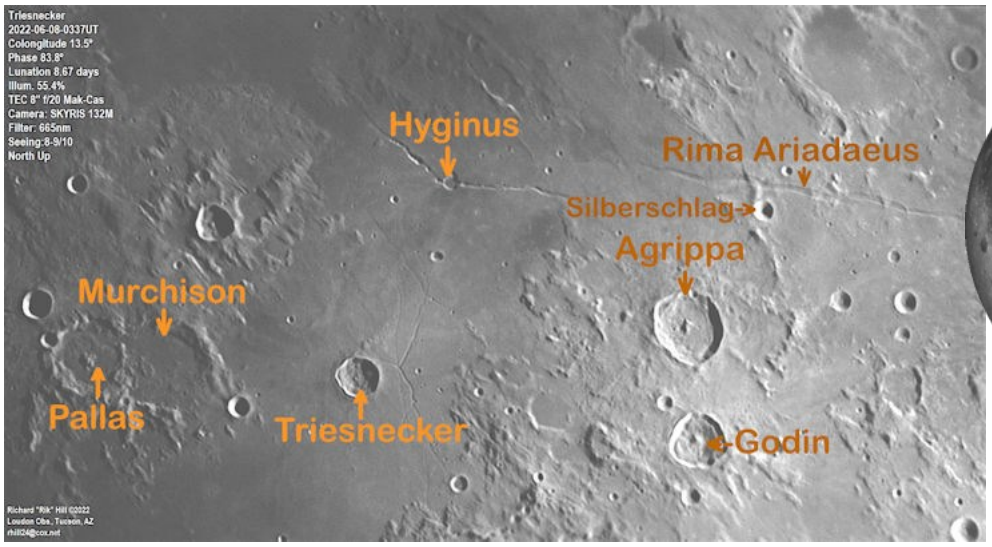
The Moon is not no-fault!

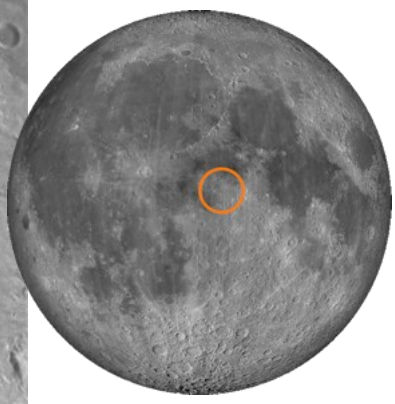


This region, virtually dead center of the visible disk of the Moon, features many rilles or rimae. But the interesting thing is that they are all of different origin. Below left of center is the crater Triesnecker (27km dia.) a young crater of Copernican age (up to 1.1 billion years old - b.y.o.). Immediately to the left of Triesnecker are the fascinating ruins of the ancient crater Murchison (60km) of Pre-Nectarian age (4.5 to 3.9 b.y.o.) and farther left is the equally interesting Pallas (51km) of Nectarian age (3.92 to 3.85 b.y.o.). Notice the rimae to the right of Triesnecker. These are thin faults in the smooth mare material of Sinus Medii, generally ranging from 1-3 km in width. North of this rimae complex is the bent line rima with a crater in the middle. The crater is Hyginus (10km) of Imbrian age (3.85-3.2 b.y.o.) and the rima, Rima Hyginus, that extends east and west from it, upon high magnification, resolves into small pits that are volcanic vents, in a fault. You can see this here if you right click on the image and open it at full resolution in a separate tab on your browser.

To the right (east) of Triesnecker are two north-south oriented craters. The northern one is Agrippa (48km) and the southern one is Godin (36km). North of this pair is another rima, Rima Ariadaeus. Right away you can see that this one is different from either of the other two previous rilles. It's a graben, a feature where a block of land between two parallel normal faults, drops down when the faults spread, forming a trough. Just below middle of this rimae is the crater Silberschlag (14km). Notice how the mountainous ridge that passes north out of this crater is crossed by the rima. The graben passes right over this ridge as if it were flat mare! It's an amazing thing to see this in some of the Apollo 10 images. There is another such crossing farther to the right (east) just past the discontinuity in the rima. A truly fascinating and geologically educational region on the Moon.

This was montage was made from parts of two images stacked from 1800 frame AVIs using AVIStack2 (IDL), combined with Microsoft ICE and finish processed with GIMP and IrfanView.





Location maps by Ralph DeCew

EAA - Excessively Argumentative Astronomers

-Brad Young, Astronomy Club of Tulsa

Don't worry, this isn't going to be a technical discussion of Electronically Assisted Astronomy, because I have no idea how it works. But, reading the message boards and eavesdropping at the Okie-Tex Star Party this month, it seems EAA has become a hot topic again. EAA has been around for years; there are posts about it from 2007 on Cloudy Nights. I'm assuming some recent improvements have brought it to the fore again. Of course, anytime you have a new method or technology in amateur astronomy, you will have adopters who jump on it with both feet and haters who also pounce on it with both feet, just in a different way. *Side note: click AstroBackyard for a great video about Okie-Tex 2022, shot by the guy selling ASIAIR there.*

My Viewpoint

You're probably assuming, since I am a nearly completely visual astronomer, that I think EAA is a bad idea. You wouldn't be wrong, for me. For everyone else, I honestly don't see what the big deal is. For nearly two centuries we have had both tactile and recorded astronomy. You can either look at a picture of something, or you can experience it as it is in the moment. Or, per Young's Law:

Visual Astronomy is a Rock Concert

Imaging is an MP3

EAA is just a different type of experience – perhaps singing along with a Cocomelon video. However, the bile spewed by people who think EAA is vile is clear and in high fidelity.

EAA is OK

Idiocy is the essence of the male mind!

Haters Gotta Hate

One of the complaints I heard was that people using EAA will be diluting the hard work of those who came before and completed astronomy discoveries, projects, or awards without that technology. I don't think Tycho Brahe has been defamed by the invention of the telescope, nor did Herschel fade away after the invention of photography. If a competition is involved, or an award for completing a project, then there should be clear rules on what is allowed. Perhaps different or modified awards should be given for those who use EAA. There will always be new technology bringing the opportunity to increase our knowledge of the universe and foster interest with a larger audience. On both points, it seems EAA could

have value.

Another complaint I have heard is an old one - that "these kids today" aren't learning the sky the way they should by star hopping and memorizing their constellations. This may be true, but mainly because

(Continued on page 23)

(Continued from page 22)
we have allowed our skies to become so light polluted that you can't see the constellations. As for star hopping, that has to do with guiding, not the quality or source of the images provided by the equipment. EAA may help amateur astronomy thrive, while hard nosed thinking may drive off beginners and alienate current observers.

Valid Points

"The Eiffel Tower and the Taj Mahal are mine to see on clear days" – Peter Townshend

Of course, one point I do agree with is that it is dangerous to let people think that the sky in their beginner scope is always just like the pictures they've seen on TV and the internet. EAA isn't there yet (until the James Webb junior model comes out). However, showing a person who's never seen Saturn before a normal view through a small telescope is going to excite them and they will have reasonable expectations. This increases the chances that they may have a good second experience with whatever equipment comes along next. If you show them an image that is enhanced too much by EAA technology, their next view of any object may be so disappointing that there is a risk they will lose all interest.

One use that seems to always slip through the cracks is helping those with visual impairment see things that may have been too faint or difficult before. Again, I'm not an expert on this technology but it would seem like there is a good fit here that could be exploited for useful accommodation for people who might otherwise not get to enjoy the sky.

So, let's see EAA for what it is, a not so new technology that just like other enhancements, has its good and bad points. It shouldn't be banned outright from observing awards, nor should it be your first sight of a celestial object. But it does have its place and should be welcomed into the pantheon of equipment that amateur astronomers use.

Further Reading

There are several websites, videos, and message board folders that discuss EAA more thoroughly if you are interested. The first entry does a good job of itemizing the pros and cons, and the others have details on equipment needed and other facets unique to this branch of observational astronomy.

https://skiesandscopes.com/electronically-assisted-astronomy/

https://www.cloudynights.com/topic/685001-eaa-announcements-beginner-guides-other-useful-links/

https://agenaastro.com/articles/miscellaneous/agena-beginners-guide-to-choosing-equipment-for-deep-sky-eaa.html

References:

https://www.youtube.com/watch?v=8uEOukbdybE

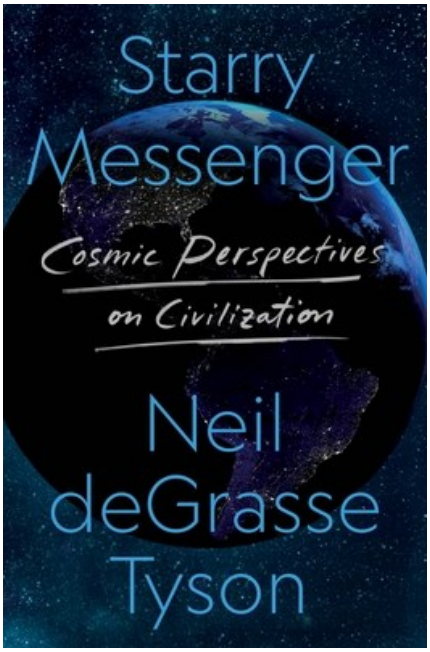
Book Review

Starry Messenger– another Galileo's sequel?

By Ed Bas

Do you know Neil deGrasse Tyson? Of course. A recent book from him: *Starry Messenger*; Cosmic Perspectives on Civilization.

An astrophysicist and a well-known best-selling author, he is the director of the Hayden Planetarium at the American Museum of Natural Science.



I like the author's perspective and amusing light touch of probability and statistics. One example: Las Vegas casinos. "The physicists (gathered for a scientific convention) were inoculated from gambling by mathematics." In his Twitter's sarcastic remarks, "Borders Books at Vegas airport doesn't have a science section. Wouldn't want to promote critical thinking before you gamble."

This author mentioned government-funded lotteries also. "In a recent contest, the odds of winning the Powerball jackpot in Tennessee were 1 in 292.2 million."

The ups and downs to stock markets: "If they were honest, here's what that headline would have read: The market rose today. We have no clue why and remain dumbfounded." Funny enough but more realistic.

A deGrasse Tyson nugget: "If you type the Big Bang Theory into a Google search engine, the top hits are all his TV show. You must scroll down some more before you find any discussions on the origin of the universe… I'm still trying to figure out whether that's a good thing or a bad thing."

Wow, I agree!

Another homophobic Bible nugget: "The woman shall not wear that which pertaineth unto a man, neither shall a man put on a woman's garment; for all that are abomination unto the LORD thy God. Clearly, the Creator of the universe cares about your choice of wardrobe."

This is my favorite, a "hypocritic" oath: "I shall never claim to have moral standards or beliefs to which my own behavior does not conform."

This Starry Messenger book is named after Galileo's book, and chapter six of his book by Jacob Bronowski. Bronowski hosted a TV series and he also wrote Ascent of Man, also.

DeGrasse Tyson is a host of Cosmos, a nice and clever TV series and a sequel to Cosmos hosted by Carl Sagan. Holy Sagan! He was a mentor of this author's astronomical career.

I really don't like StarTalk, hosted by deGrasse Tyson, a TV series about science and humor. Not funny or not really knowledgeable– but it's my opinion. His recent book, Astrophysicists for People in a Hurry and a TV spinoff called StarTalk Sports Edition. I can skip both of them.

Starry Messenger is not an astronomy book. In this book, he wrote science-oriented Starmus Science Festival, asteroids, eclipses, rockets and robots, and the honorable Moon. Though he tackled tough subjects: vegetarians & death, discrimination & race (not a space race, darn it!), and "the foundation of civilization." You can agree– or not. Opinion is his. But it should be placed in your bookshelf, along with copies of Bronowski and Sagan. Thumbs up!

History S.I.G.

November 1984

This month's cover features a group shot of the club members. Going inside, following the club events and meeting minutes, we find…

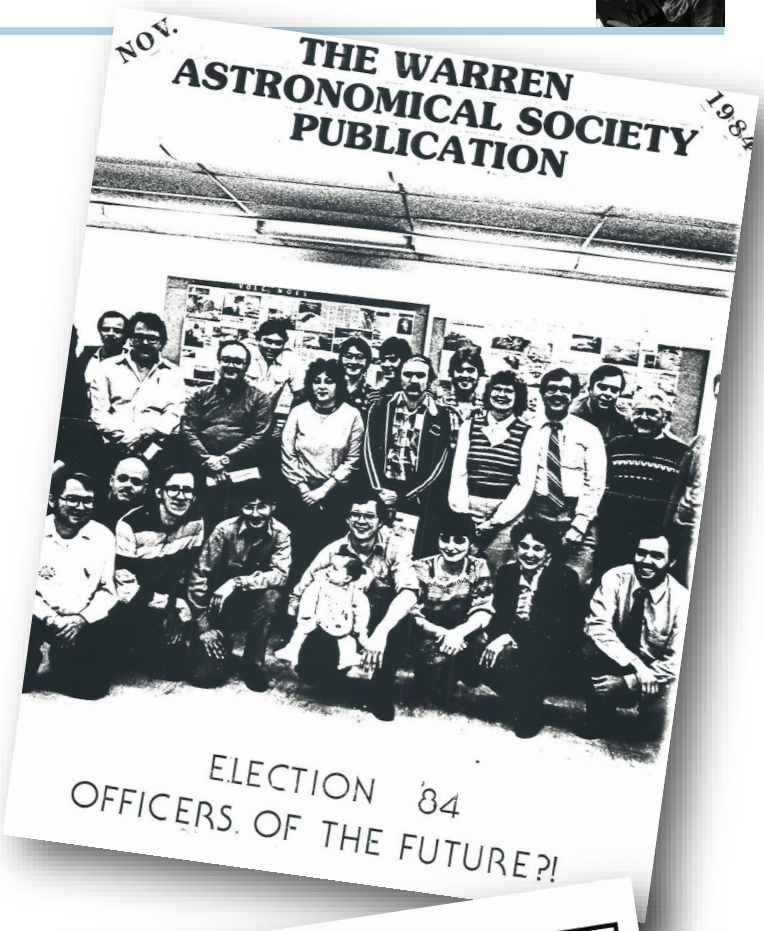
Letters:

A thank you from Cranbrook Institute of Science for our participation in a star party event, apparently rescued from the Michigan Nebula by a slideshow from Ken Strom.

Then there was this proposal from Linda Blanchard concerning creating an observing location list.

Continuing in the newsletter we have the charts, "Location of the Sun, Moon and Planets" submitted by Raymond Bullock (who continues to provide us with the Cranbrook Sky Chart) and the "Positions for Comet Austin - 1984I", and…a wordsearch puzzle from Raymond.

We finish the issue with an "Observing Report" by Doug Bock.


NOV.

THE WARREN ASTRONOMICAL SOCIETY PUBLICATION

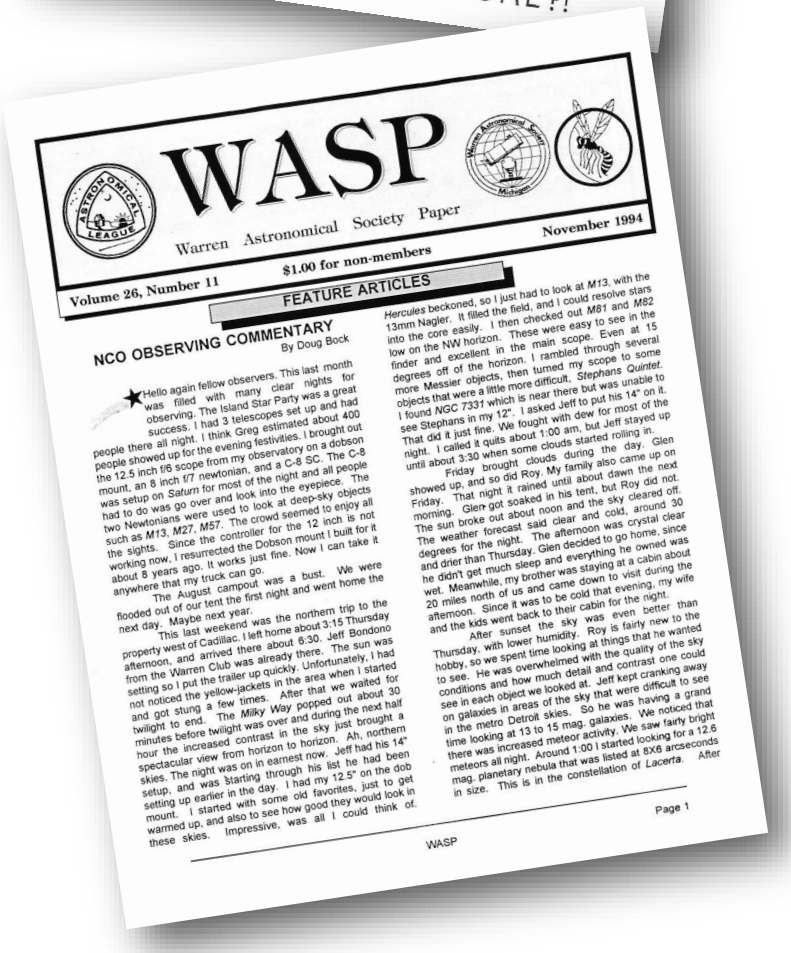
1984

ELECTION '84
OFFICERS OF THE FUTURE?!

November 1994

In this issue, Doug Bock's observing report moves for 1984's back page to the front in "NCO Observing Commentary". More observing and reporting in "Star Party Notes and M31" through an 8-inch by Jeff Bondono.

Of course, there is "Computer Chatter" by Larry F. Kalinowski and Louie the Librarian's Book of the Month- *Larousse Encyclopedia of Astronomy*.


WASP

Warren Astronomical Society Paper

Volume 26, Number 11 $1.00 for non-members November 1994

FEATURE ARTICLES

NCO OBSERVING COMMENTARY

By Doug Bock

Hello again fellow observers. This last month was filled with many clear nights for observing. The Island Star Party was a great success. I had 3 telescopes set up and had people there all night. I think Greg estimated about 400 people showed up for the evening festivities. I brought out the 12.5 inch f/6 scope from my observatory on a dobson mount, an 8 inch f/7 newtonian, and a C-8 SC. The C-8 was setup on Saturn for most of the night and all people had to do was go over and look into the eyepiece. The two Newtonians were used to look at deep-sky objects such as M13, M27, M57. The crowd seemed to enjoy all the sights. Since the controller for the 12 inch is not working now, I resurrected the Dobson mount I built for it about 8 years ago. It works just fine. Now I can take it anywhere that my truck can go.

The August campout was a bust. We were flooded out of our tent the first night and went home the next day. Maybe next year.

This last weekend was the northern trip to the property west of Cadillac. I left home about 3:15 Thursday afternoon, and arrived there about 6:30. Jeff Bondono from the Warren Club was already there. The sun was setting so I put the trailer up quickly. Unfortunately, I had not noticed the yellow-jackets in the area when I started and got stung a few times. After that we waited for twilight to end. The Milky Way popped out about 30 minutes before twilight was over and during the next half hour the increased contrast in the sky just brought a spectacular view from horizon to horizon. Ah, northern skies. The night was on in earnest now. Jeff had his 14" setup, and was starting through his list he had been setting up earlier in the day. I had my 12.5" on the dob mount. I started with some old favorites, just to get warmed up, and also to see how good they would look in these skies. Impressive, was all I could think of. Hercules beckoned, so I just had to look at M13, with the 13mm Nagler. It filled the field, and I could resolve stars into the core easily. I then checked out M81 and M82 low on the NW horizon. These were easy to see in the finder and excellent in the main scope. Even at 15 degrees off of the horizon, I rambled through several more Messier objects, then turned my scope to some objects that were a little more difficult, Stephans Quintet. I found NGC 7331 which is near there but was unable to see Stephans in my 12". I asked Jeff to put his 14" on it. That did it just fine. We fought with dew for most of the night. I called it quits about 1:00 am, but Jeff stayed up until about 3:30 when some clouds started rolling in.

Friday brought clouds during the day. Glen showed up, and so did Roy. My family also came up on Friday. That night it rained until about dawn the next morning. Glen got soaked in his tent, but Roy did not. The sun broke out about noon and the sky cleared off. The weather forecast said clear and cold, around 30 degrees for the night. The afternoon was crystal clear and drier than Thursday. Glen decided to go home, since he didn't get much sleep and everything he owned was wet. Meanwhile, my brother was staying at a cabin about 20 miles north of us and came down to visit during the afternoon. Since it was to be cold that evening, my wife and the kids went back to their cabin for the night.

After sunset the sky was even better than Thursday, with lower humidity. Roy is fairly new to the hobby, so we spent time looking at things that he wanted to see. He was overwhelmed with the quality of the sky conditions and how much detail and contrast one could see in each object we looked at. Jeff kept cranking away on galaxies in areas of the sky that were difficult to see in the metro Detroit skies. So he was having a grand time looking at 13 to 15 mag. galaxies. We noticed that there was increased meteor activity. We saw fairly bright meteors all night. Around 1:00 I started looking for a 12.6 mag. planetary nebula that was listed at 8X6 arcseconds in size. This is in the constellation of Lacerta. After

WASP

Page 1

From the Scanning Room

I've mentioned in the meetings that there was a still missing printed issue from 1999 (August) and I was considering recreating it from the HTML version. I already had the graphics from the other scans and a Publisher template ready to go.

The project was going swimmingly until I realized that the sun/moon calendar on the last page graphic from the other months just wouldn't do. Timeanddate.com to the rescue. I was able to get the rise/set times and plug them in a replica of the calendar that appeared in the other issues.

I think it went well, check it out:
http://www.warrenastro.org/was/newsletter/WASP-1999-08-temp.pdf

Dale Thieme,
Chief scanner

CRANBROOK INSTITUTE OF SCIENCE
Michigan's Museum of Natural History

NOVEMBER 2022

Notable Sky Happenings

Nov. 1 - 7

The Moon is below Saturn on the 1st and below Jupiter on the 4th (S-SE evening). Daylight Saving Time ends at 2:00am on the 6th.

Nov. 8 - 14

Total lunar eclipse morning of the 8th. (The bright "star" above the Moon in the WSW is Jupiter.) Umbral phase begins at 4:09am EST, totality beginst 5:16, maximum eclipse 5:59, totality ends 6:41, umbral phase ends 7:49, but the Moon sets at 7:22. The Moon is at the upper right of Mars on the 10th (ENE evening).

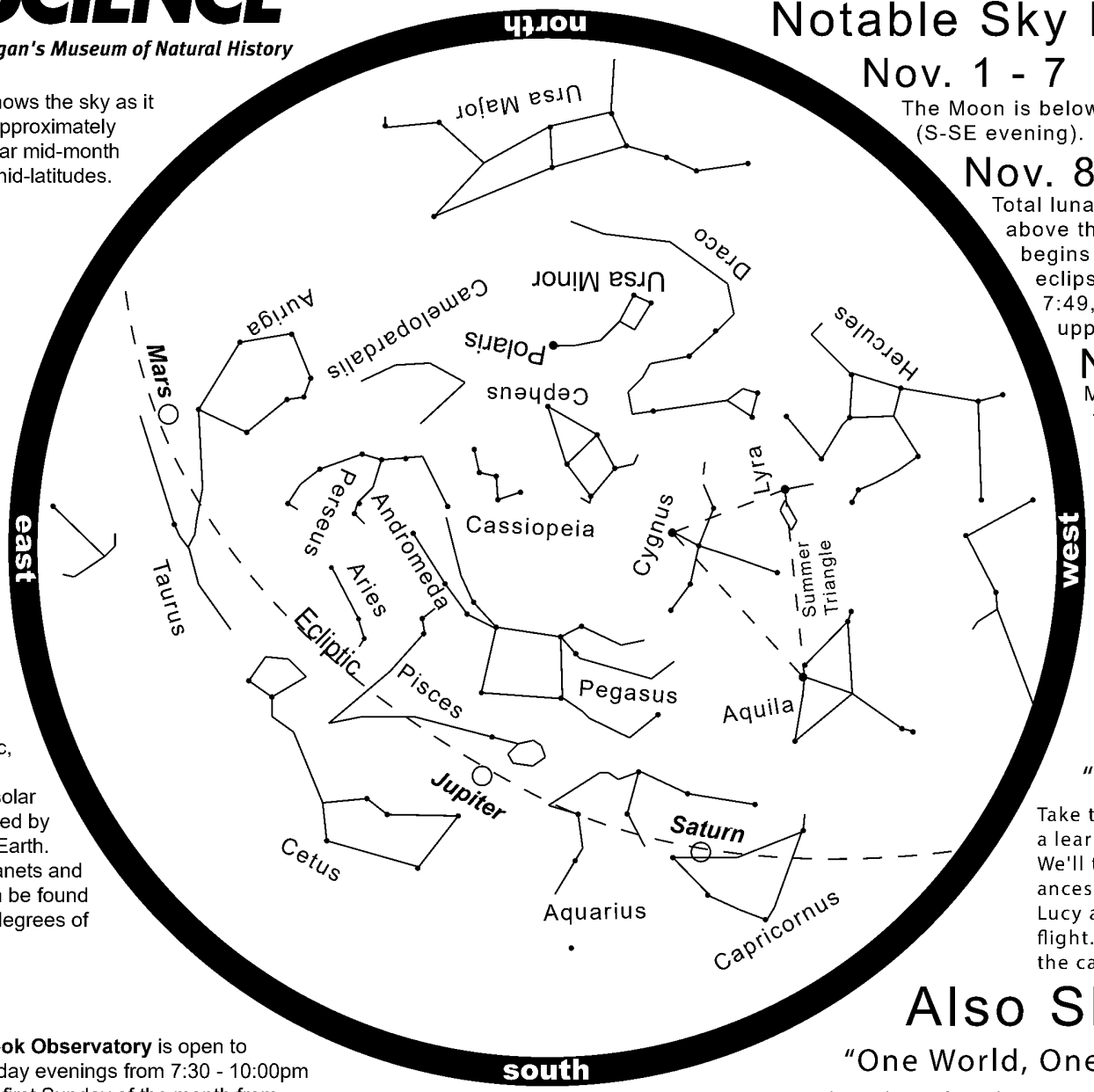
Nov. 15 - 21

Moon is at the upper right of Regulus on the 16th and upper left on the 17th (S predawn). Leonid meteor shower peaks Nov. 17-18. Expect an average of 15 meteors per hour.

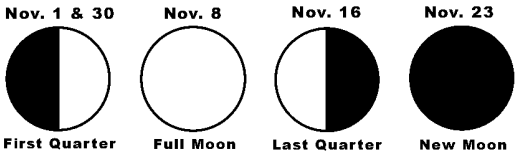
Nov. 22 - 30

Moon is below Saturn on the 28th (SW eve.).

This chart shows the sky as it appears at approximately 8pm EST near mid-month at northern mid-latitudes.



What is that dashed line? It's the ecliptic, the reference plane of the solar system, defined by the Sun and Earth. The major planets and the Moon can be found within a few degrees of this plane.



Now Showing

"Dinosaurs at Dusk"

Take to the skies and discover the origins of flight! It's a learning adventure of a father and his daughter, Lucy. We'll travel back in time to meet the pterosaurs and the ancestors of modern-day birds, the feathered dinosaurs. Lucy and her father look for clues about the origins of flight. When time runs out, they experience first-hand the cataclysmic "last day" of the dinosaurs.

Also Showing

"One World, One Sky: Big Bird's Adventure"

When Elmo's friend, Hu Hu Zhu, visits from China. Big Bird, Elmo and Hu Hu Zhu take viewers on an exciting discovery of the Sun, Moon, and stars. They learn about the Big Dipper and the North Star and take an imaginary trip to the Moon where they learn that the Moon is a very different place.

The Cranbrook Observatory is open to the public Friday evenings from 7:30 - 10:00pm EST, and the first Sunday of the month from 1:00 - 4:00pm for solar viewing.

For observatory information visit http://science.cranbrook.edu/explore/observatory

For astronomy information visit http://science.cranbrook.edu

Brian Odell - Lunar Eclipse Series

November 2022

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5 S Taurid Meteor Shower
6 Daylight Saving Time ends	7 Cranbrook WAS Officer elections	8 Total Lunar Eclipse; mag=1.359 FULL MOON Election Day	9	10	11 Remembrance Day (Can.) Veteran's Day (USA)	12 N Taurid Meteor Shower
13	14 Moon at Apogee: 404924km	15	16	17 Leonid Meteor Shower Macomb	18	19
20	21	22	23 NEW MOON	24 Thanksgiving	25 Moon at Perigee: 362826km	26 Stargate Open House
27	28	29	30			

Stargate Observatory

Monthly Free Astronomy Open House and Star Party

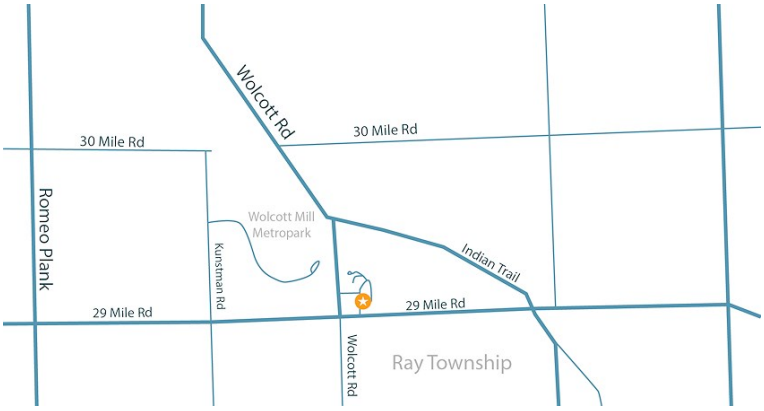
5:00 pm EST, 4th Saturday of the month!
Wolcott Mill Metropark - Camp Rotary entrance

Advisory: Concerns are circulating in the amateur astronomy community about a possibility of COVID-19 being passed from one person to another via contact of different persons' eyes with a telescope eyepiece. Sharing telescopes may be considered by some to be high-risk due to the possibility of eyes touching eyepieces. Masks are encouraged, mandatory for children.

- Sky tours.
- See different telescope types in operation.
- Get help with your telescope.
- We can schedule special presentations and outings for scouts, student or community groups.

Contact: outreach@warrenastro.org

Find us on MeetUp.com



20505 29 Mile Rd (1.8 miles east of Romeo Plank Rd) Ray, MI 48096
82° 55'04" West Longitude, 42° 45'29" North Latitude

Observatory Rules:

- Closing time depends on weather, etc.
- May be closed one hour after opening time if no members arrive within the first hour.
- Contact the 2nd VP for other arrangements, such as late arrival time. Call 586-909-2052.
- An alternate person may be appointed to open.
- Members may arrive before or stay after the scheduled open house time.
- Dates are subject to change or cancellation depending on weather or staff availability.
- Postings to the Yahoo Group and/or email no later than 2 hours before starting time in case of date change or cancellation.
- It is best to call or email the 2nd VP at least 2 hours before the posted opening with any questions. Later emails may not be receivable (secondvp@warrenastro.org).
- Generally, only strong rain or snow will prevent the open house... the plan is to be there even if it is clouded over. Often, the weather is cloudy, but it clears up as the evening progresses.

Stargate Report

Stargate Observatory Open House October 22, 2022

The Observatory was opened at 6:30 pm. The sky was clear and weather conditions were good, however the seeing was not steady.

Many people attended the open house including WAS members, scouts, and the general public. A few telescopes were set up outside the observatory and Jeff Macleod brought his spaceship capsule simulator and provided demonstrations.

Many objects were observed through the 8 inch refractor and the scopes outside including Saturn, Jupiter, Mars, DSOs, Double stars.

The observatory was closed at 3:30 am after most people left.

Next open house is scheduled for November 26, 2022.

Riyad I. Matti
2022 WAS 2nd VP.
Observatory Chairperson

Treasurer's Report

Treasurer's Report for October 31, 2022

BOA account:

Balance: $29,592.13
Deposits: 52.00
Payments: 315.49
(Equipment; reimbursements for Meetup, Webex, and travel costs)

PayPal Account:

Balance: $329.93
Received: 48.02
Paid 15.20
(mailing)

Total Paid Memberships 126

News from the Treasury:

The process for ordering a physical copy of Sky & Telescope has changed, and prices have gone up above $40 per year for a member of an astronomy club. Please let me know via email at treasurer@warrenastro.org if you would like more information.

Adrian Bradley,
Treasurer

Astronomical Events for November 2022

Add one hour for Daylight Savings Time
Source:
http://astropixels.com/almanac/almanac21/almanac2022est.html

Day	EST (h:m)	Event
01	01:37	FIRST QUARTER MOON
01	16:08	Saturn 4.2°N of Moon
04	15:19	Jupiter 2.4°N of Moon
05	13:00	S Taurid Meteor Shower
08	01:08	Moon at Ascending Node
08	05:59	Total Lunar Eclipse; mag=1.359
08	06:02	FULL MOON
08	11:00	Mercury at Superior Conjunction
09	04:00	Uranus at Opposition
09	07:16	Pleiades 2.7°N of Moon
11	08:43	Mars 2.5°S of Moon
12	12:00	N Taurid Meteor Shower
13	18:43	Pollux 1.7°N of Moon
14	01:41	Moon at Apogee: 404924 km
16	08:27	LAST QUARTER MOON
17	19:00	Leonid Meteor Shower
20	22:36	Spica 4.3°S of Moon
22	11:23	Moon at Descending Node
23	17:57	NEW MOON
25	20:30	Moon at Perigee: 362826 km
28	23:40	Saturn 4.2°N of Moon
30	09:36	FIRST QUARTER MOON

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You Shop. Amazon Gives.

If you're shopping on Amazon, make sure to use Amazon Smile. It costs you nothing, and if you select us as your charity, Amazon will donate 0.5% of every purchase you make to the Warren Astronomical Society.

Outreach Report

Oct 7th Outreach Event

Rick Gossett reports:

I just got back from the outreach at Saint Isaac Jogues Catholic School in St. Claire Shores. Bob Berta and Angelo DiDonato gave an excellent presentation on astronomy. After the presentation, we had 3 scopes set up on the soccer field, and everyone got some pretty good views of Jupiter, Saturn, the Moon, and Neptune. They also were able to get an introduction to digital imaging. We captured Saturn, as a group. It turned out to be a pretty good evening.

Photo: Rick Gossett

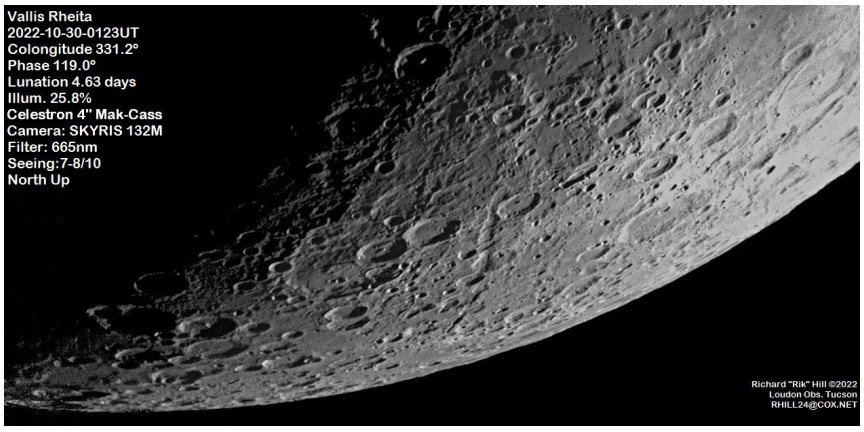
Left: From the Saturn group project.

Astronomy Night at the Belle Isle Nature Resource Center

Friday night, October 21, 2022 Astronomy Night was hosted by WSU Planetarium, Detroit Audubon, and the Detroit Zoological Society at the Belle Isle Nature Center– aided by our members:

Adrian Bradley reports:

Jeff MacLeod and I were there representing the Warren Astronomical Society, and I counted maybe two more including a new member who planned to attend Saturday's open house.



From Rik Hill:

As some of you know, I take telescopes out to show the kids things in the sky. With the Moon, Jupiter and Saturn it should be quite a show. So tonight I took out the 4" Celestron Mak-Cass to shake out the cobwebs after it had been in just sitting for a year. The Moon gave me a good target and I will set up the Celestron 4", the Celestron 5 and the Questar on Monday night. I urge you all to do this. It's really a thrill when people bring their children who looked through your telescopes when they were children!

Here's one of the images I got with the 4".

Meeting Minutes

WARREN ASTRONOMICAL SOCIETY
MINUTES OF BOARD MEETING
OCTOBER 3, 2022 @ 6:30PM

Meeting called to order @ 6:30PM. Officers in attendance: Diane Hall, Bob Trembley, Mark Kedzior, Kevin McLaughlin – (Virtual attendance) Riyad Matti, Dale Thieme – quorum present.

OFFICER REPORTS:

President Diane Hall will serve on both the election committee and nominations committee to recruit candidates for board officer positions.

1st VP Bob Trembley has confirmed banquet speaker availability for Monday, December 5th.

2nd VP Riyad Matti reported on the Open House of September 24th – skies were cloudy but had visitors. Jeff MacLeod acquired trailer dolly for the Big Dob Cargo Trailer to help with moving trailer from parking area to ideal location for hitching up for transport. The next Open House is October 22nd.

Secretary Mark Kedzior reported that 2023 WAS Calendars are available for on line ordering through our website and also will have them for sale at our in-person Cranbrook meetings. He has also prepared the WAS Banquet "Beg" letters to be mailed to our various astronomy vendors for donations of door prizes.

Outreach Chair Kevin McLaughlin reports that Mark Kedzior will be at the Warren Civic Center Library with telescope on November 9th for the NASA @ My Library Grant program, starting around 6PM.

Publications Chair Dale Thieme reports the October 2022 edition of the WASP is up on line.

OLD BUSINESS:

WAS Website overhaul – Dale Thieme gave update on progress of the migration to a WAS owned site.

Calendar Committee – calendars have arrived – cost is $20 per calendar, and $20 + $5 S&H if mailed. A total of 50 calendars were ordered and received.

Recognition for D.K. at December 5th meeting/ banquet.

NEW BUSINESS:

Big Dob upgrade – Mark Kedzior and meeting attendee Marty Kunz explained to board about purchasing an upgrade to ease assembly of the Big Dob in the form of truss tube clamps from Webster Telescopes of Garden City. After discussion, motion by Mark Kedzior to purchase necessary amount of truss clamps from Webster Telescopes for NMT $250 – second by Kevin McLaughlin. Motion passed.

Discussion on Service Awards selections and criteria of awards. Recognition for Greg Nizio discussed for volunteering to haul Big Dob to AATB.

Election Committee – Diane Hall will ask for volunteers to run for board positions that are term limited during regular meeting that follows.

Discussion on individual snacks for Cranbrook meetings – Bob Trembley will check for individual nut-free packaged snacks for our Cranbrook break times. Discussion on SWAG through third party vendors – Bob Trembley will explore options and prices on WAS gear.

Discussion on honorarium for Gary Ross/Clayton Carey for 10/3 presentation. Motion by Kevin McLaughlin to pay $88 for mileage to and from transportation of Gary Ross/Clayton Carey for 10/3 presentation. Second by Bob Trembley. Motion passed. Payment will go to Earl Goodrich ("Uncle Earl") who provided transportation for Gary/Clayton.

Motion to adjourn by Bob Trembley – second by Kevin McLaughlin.

Meeting adjourned at 7:09 PM.

Respectfully submitted,
Mark Kedzior
WAS Secretary

WARREN ASTRONOMICAL SOCIETY
CRANBROOK MEETING (w/Live Streaming)
OCTOBER 3, 2022 7:30PM

Meeting called to order for in person Cranbrook meeting with live streaming at 7:35PM by President Diane Hall. Number of persons in attendance - 27(WebEx attendance – 9 & YouTube attendance – 7 @ 8:30PM). Meeting began with introduction of attendees and new members.

OFFICER REPORTS:

President Diane Hall thanked all the WAS volunteers and "Big Dob" crew that participated at the Astronomy at the Beach event on September 16-17. She also announced the passing of Wendee Levy, wife of David Levy, on September 23rd. She reported that 2023 WAS Calendars are now available and on sale – Mark Kedzior will facilitate the sale of calendars during the break. The December 5th WAS Cranbrook meeting will also be our "Awards Banquet" – this will be the only meeting for the month of December.

Volunteers are needed for the Nominations and Elections Committees, both of which Diane will preside over – any persons interested in running for a board position (many are term limited) please see

(Continued from page 31)

Diane or current board member to express you interest.

1st VP Bob Trembley reports that Karim Jaffar will be our keynote speaker for the December 5th Meeting/Awards Banquet, and also gave update on upcoming presentations.

2nd VP Riyad Matti gave the Observatory/Open House report of September 24 – the next open house will be October 22.

Secretary Mark Kedzior reported the September meeting minutes are in the WASP and has the 2023 WAS Calendars on site for sale at the break for $20 each.

Treasurer's Report – Dale Thieme read the Treasurer's Report provided by Adrian Bradley (attending Okie-Tex Star Party).

Outreach – Mark Kedzior will be at Warren Civic Center Library on November 9th for Family Astronomy Night. Volunteers are needed with telescopes for astronomy event on October 21st at Belle Isle Nature Center.

Publications Chair Dale Thieme reports the October WASP is up on line.

SPECIAL INTEREST GROUPS:

Solar – Marty Kunz reported on solar activity with many active groups, coronal holes and minor auroras occurring.

Astrophotography – Bill Beers gave a Calendar Committee report, thanking all who contributed images to this calendar, and reports that this year's calendar was provided by a new company/vendor.

OBSERVING REPORTS:

David Levy reported from Arizona on observing and gave his usual special reading. Doug Bock shared images of his solar images through his 6" SCT. Diane Hall reported on her observing through her 8 and 10 inch dobs up in Alcona County – although windy, great skies for observing – M33, Jupiter, Mars, Aldebaran, Capella, and the Double Cluster were on her menu of observing targets (along with Jonathan Kade). Adrian Badley called in (177 miles from Detroit) with the Okie-Tex Star Party report). Marty Kunz reported observing Jupiter and Saturn through the Big Dob at the AATB event at Island Lake – the Great Red Spot on Jupiter was very prominent for observers to see.

SHORT PRESENTATION:

Bob Trembley introduced former WAS President Jeff MacLeod and his presentation "Quasi Static Density Wave Theory (Musings on Emulating Spiral Galaxies)". In his brief presentation, Jeff explained his attempts on "creating" spiral galaxies through a computer simulation program. His visual presentation helped explain galaxy rotation, rotation curves, the "winding" problem and density wave theory. Questions and discussion followed his excellent presentation. To see his presentation in its entirety, go to:

https://www.youtube.com/warrenastro

MAIN PRESENTATION:

Bob Trembley introduced Gary M. Ross, former WAS President and "Greatest Observer in Michigan", and Clayton V. Carey, with their presentation, "In Defense of Astrology". Gary and Clayton did a thorough historical research in this presentation, from the influences of the Greeks (love of geometry), Babylon (methodical arithmetic), Ptolemy (Second Century C.E –"Almagest" and "Tetrabiblos"), Marcus Manilius (1st C.E. – "Astronomicon" – five books with four on astrology), the early fathers of the Church and political allies' hostility towards astrology, St. Thomas Aquinas, Tycho Brahe, and their understanding of the relationship of astrology to astronomy, just to name some of the historical figures in their research. Questions and discussion followed this excellent presentation. To see this presentation in its entirety, go to:

https://www.youtube.com/warrenastro

Meeting ended at 9:40PM.

Respectfully submitted,
Mark Kedzior
WAS Secretary

WARREN ASTRONOMICAL SOCIETY
MACOMB (VIRTUAL) MEETING
OCTOBER 20, 2022 7:30PM

Meeting called to order at 7:30 PM by President Diane Hall. Officers in attendance: Bob Trembley, Riyad Matti, Mark Kedzior, Adrian Bradley, Dale Thieme (WebEx attendance – 17 & YouTube –6@ 8:15 PM).

OFFICER REPORTS:

President Diane Hall reported on the 2023 WAS Calendars being available for sale via the WAS website or in person at the Cranbrook meeting for $20 each or mailed at$20 +$5 S&H. The November Cranbrook meeting will have the election of 2023 WAS Officers – looking for individuals who would like to serve in a board position – two positions are term-limited (President, 2nd VP) – if interested or know of an individual who would like to serve, please contact Diane or any board member for information. Distinguished Service Awards – nominations or suggestions needed as to individuals who have distinguished themselves in the WAS for our Awards Banquet on Monday, December 5th. Please give names of individuals to any of the board members for consideration for any of the service awards.

1st VP Bob Trembley gave upcoming presentation schedule.

2nd VP Riyad Matti gave the September 24 Open

(Continued from page 32)

House/Observatory report, and the next Open House will be Saturday, October 22.

Secretary Mark Kedzior reports that there are 20 calendars left for purchase and will be available at the next Cranbrook meeting.

Treasurer Adrian Bradley gave treasury report – the WAS has currently over 100 paid up members. He also gave a report on the Astronomical League. Outreach – volunteers are needed with telescopes for "Sidewalk Astronomy" at Belle Isle Nature Center on Friday, October 21st, from 7:30 to 9:30 PM.

Publications Chair Dale Thieme reports the WASP is on line.

SPECIAL INTEREST GROUPS:

Solar – Bob Trembley shared current solar images from SOHO. History – No activity at this time. Double Star Group – will be observing selected list at Open House. Astrophotography – no report. Discussion Group – if interested in hosting a discussion group meeting, please contact Jeff MacLeod for information.

OBSERVING REPORTS:

David Levy reports searching for comets in the Arizona night skies – read a quotation from King John regarding the honoring of the Orionid Meteor Shower. Bob Trembley discussed his podcast subject. Adrian Bradley gave brief Okie-Tex Star Party report.

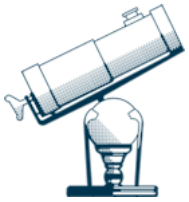
MAIN PRESENTATION:

Bob Trembley introduced Dr. Dale Partin with his presentation "The JUICE and Europa Clipper Missions". In his presentation, Dr. Partin explained the combined ESA and NASA missions to explore the moons of Jupiter. **PUBLIC SERVICE ANNOUNCEMENT - Dr. Partin asked that WAS members consider volunteering to give a presentation at a future meeting (now, back to the presentation).** He also gave the background, descriptions and explanations on the Galilean moons, the missions to Jupiter from 1972 to present, geological activity of the Galilean moons, radiation bands around Jupiter, the magnetosphere of Jupiter (20,000 times larger than the earth's), the radiation levels of the Galilean moons (in sieverts), proposed NASA Radiation Exposure Limits for Humans, Ten (eleven) JUICE Instruments (JUICE= JUpiter ICy Moons Explorer) to study the subsurface oceans (especially on Ganymede), gravity science to determine structures of the moons, and JUICE flybys studies of Europa. He followed with the history and instruments on the NASA Europa Clipper Mission and other Clipper "options" and an explanation of the early instruments on the Pioneer 10 mission. The EAS JUICE Mission's expected launch is April 2023 with arrival by July 2031(8 years). The Europa Clipper's expected launch is October 2024 (with 5.5 years travel) to Jupiter. Questions and discussion followed his informative and thorough report. To see his presentation in its entirety, go to:

https://www.youtube.com/warrenastro

Meeting ended at 9:20PM.

Respectfully submitted,
Mark Kedzior
Secretary, WAS



W.A.S.P. Photo and Article Submissions

We'd like to see your photos and articles in the W.A.S.P. Your contribution is ESSENTIAL! — This is YOUR publication!

Send items to: publications@warrenastro.org

Documents can be submitted in Microsoft Word (.doc or .docx), Open Office (.ods), or Text (.txt) formats, or put into the body of an email. Photos can be embedded in the document or attached to the email and should be under 2MB in size. Please include a caption for your photos, along with dates taken, and the way you 'd like your name to appear.

The Warren Astronomical Society is a Proud Member of the Great Lakes Association of Astronomy Clubs (GLAAC)

GLAAC is an association of amateur astronomy clubs in Southeastern Michigan who have banded together to provide enjoyable, family-oriented activities that focus on astronomy and space sciences.

GLAAC Club and Society Meeting Times

Club Name & Website	City	Meeting Times
Astronomy Club at Eastern Michigan University	Ypsilanti/EMU	Every Thursday at 7:30PM in 402 Sherzer
Capital Area Astronomy Club	MSU/Abrams Planetarium	First Wednesday of each month 7:30 PM
Farmington Community Stargazers	Farmington Hills	Members: Last Tuesday of the month Public observing: 2nd Tuesday of the month
Ford Amateur Astronomy Club	Dearborn	Fourth Thursday of every month (except November and December) at 7:00 PM
McMath-Hulbert Astronomy Society	Lake Angelus	Board and paid members-First Sunday of the month Public open house—first Saturday at 11 am
Oakland Astronomy Club	Rochester	Second Sunday of every month (except May)
Seven Ponds Astronomy Club	Dryden	Monthly: generally the Saturday closest to new Moon
Sunset Astronomical Society	Bay City/Delta College Planetarium	Second Friday of every month
University Lowbrow Astronomers	Ann Arbor	Third Friday of every month
Warren Astronomical Society	Bloomfield Hills/ Cranbrook & Warren/ MCC	First Monday & third Thursday of every month 7:30 PM

GLAAC Club and Society Newsletters

Warren Astronomical Society: http://www.warrenastro.org/was/newsletter/
Oakland Astronomy Club: http://oaklandastronomy.net/
McMath-Hulbert Astronomy Club http://www.mcmathhulbert.org/solar/newsletter/
Ford Amateur Astronomy Club: http://www.fordastronomyclub.com/starstuff/index.html
University Lowbrow Astronomers: http://www.umich.edu/~lowbrows/reflections/

WAS Member Websites

Jon Blum: Astronomy at JonRosie
Bill Beers: Sirius Astro Products
Jeff MacLeod: A Life Of Entropy

Bob Trembley: https://www.vaticanobservatory.org/profile/rtrembley
Bob Trembley: Vatican Observatory Foundation Blog
Steven Aggas: http://apache-sitgreaves.org/

Doug Bock:
Facebook: Northern Cross Observatory https://www.facebook.com/NorthernCrossObservatory
Boon Hill and NCO Discussion https://www.facebook.com/groups/369811479741758
Flickr (astrophotography album): https://www.flickr.com/photos/141833769@N05/
YouTube channel: https://www.youtube.com/channel/UC-gG8v41t39oc-bL0TgPS6w

This article is distributed by NASA Night Sky Network
The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

Cepheus: A House Fit for a King

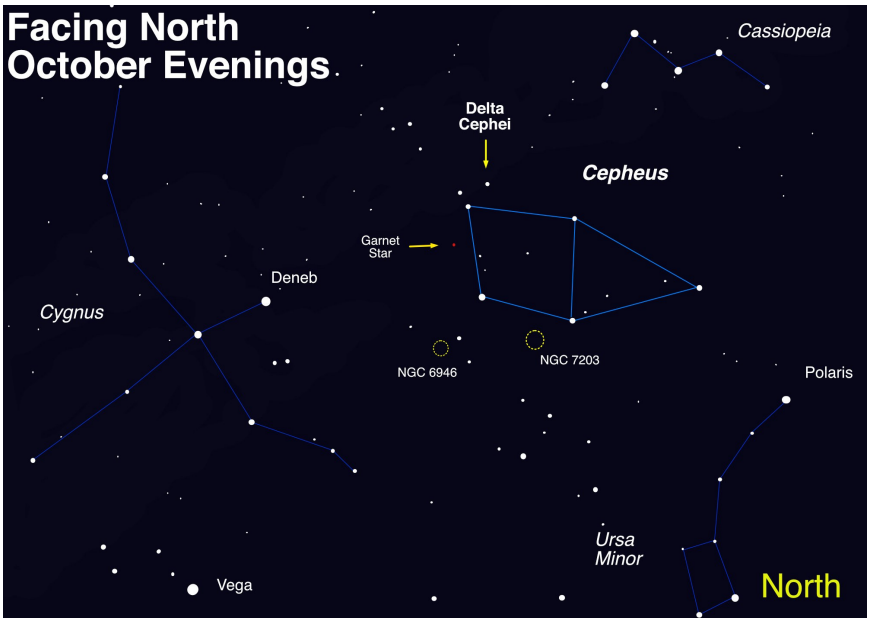
David Prosper

Sometimes constellations look like their namesake, and sometimes these starry patterns look like something else entirely. That's the case for many stargazers upon identifying the constellation of **Cepheus** for the first time. These stars represent Cepheus, the King of Ethiopia, sitting on his throne. However, many present-day observers see the outline of a simple house, complete with peaked roof, instead – quite a difference! Astronomers have another association with this northern constellation; inside its borders lies the namesake of one of the most important types of stars in modern astronomy: Delta Cephei, the original **Cepheid Variable**.

Cepheus is a circumpolar constellation for most observers located in mid-northern latitudes and above, meaning it does not set, or dip below the horizon. This means Cepheus is visible all night long and can be observed to swing around the northern celestial pole, anchored by Polaris, the current North Star. Other circumpolar constellations include Cassiopeia, Ursa Major, Ursa Minor, Draco, and Camelopardalis. Its all-night position for many stargazers brings with it some interesting objects to observe. Among them: the "Garnet Star" Mu Cephei, a supergiant star with an especially deep red hue; several binary stars; several nebulae, including the notable reflection nebula NGC 7023; and the "Fireworks Galaxy" NGC 6946, known for a surprising number of supernovae.

Perhaps the most famous, and certainly the most notable object in Cepheus, is the star **Delta Cephei**. Its variable nature was first discovered by John Goodricke, whose observations of the star began in October 1784. Slightly more than a century later, Henrietta Leavitt studied the variable stars found in the Magellanic Clouds in 1908 and discovered that the type of variable stars represented by Delta Cephei possessed very consistent relationships between their luminosity (total amount of light emitted), and their pulsation period (generally, the length of time in which the star goes through a cycle of where it dims and then brightens). Once the period for a Cepheid Variable (or **Cepheid**) is known, its luminosity can be calculated by using the scale originally developed by Henrietta Leavitt, now called "Leavitt's Law.". So, if a star is found to be a Cepheid, its actual brightness can be calculated versus its observed brightness. From that difference, the Cepheid's distance can then be estimated with a great deal of precision. This revolutionary discovery unlocked a key to measuring vast distances across the cosmos, and in 1924 observations of Cepheids by Edwin Hubble in what was then called the Andromeda Nebula proved that this "nebula" was actually another galaxy outside of our own Milky Way! You may now know this object as the "Andromeda **Galaxy**" or M31. Further observations of Cepheids in other galaxies gave rise to another astounding discovery: that our universe is not static, but expanding!

Because of their importance as a "standard candle" in measuring cosmic distances, astronomers continue to study the nature of Cepheids. Their studies revealed that there are two distinct types of Cepheids: Classical and Type II. Delta Cephei is the second closest Cepheid to Earth after Polaris, and was even studied in detail by Edwin Hubble's namesake telescope, NASA's Hubble Space Telescope, in 2008. These studies, along with others performed by the ESA's Hipparcos mission and other observatories, help to further refine the accuracy of distance measurements derived from observations of Cepheids. What will further observations of Delta Cephei and other Cepheids reveal about our universe? Follow NASA's latest observations of stars and galaxies across our universe at nasa.gov.



The stars of Cepheus are visible all year round for many in the Northern Hemisphere, but fall months offer some of the best views of this circumpolar constellation to warmly -dressed observers. Just look northwards! Image created with assistance from Stellarium: stellarium.org.

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(Continued from page 35)

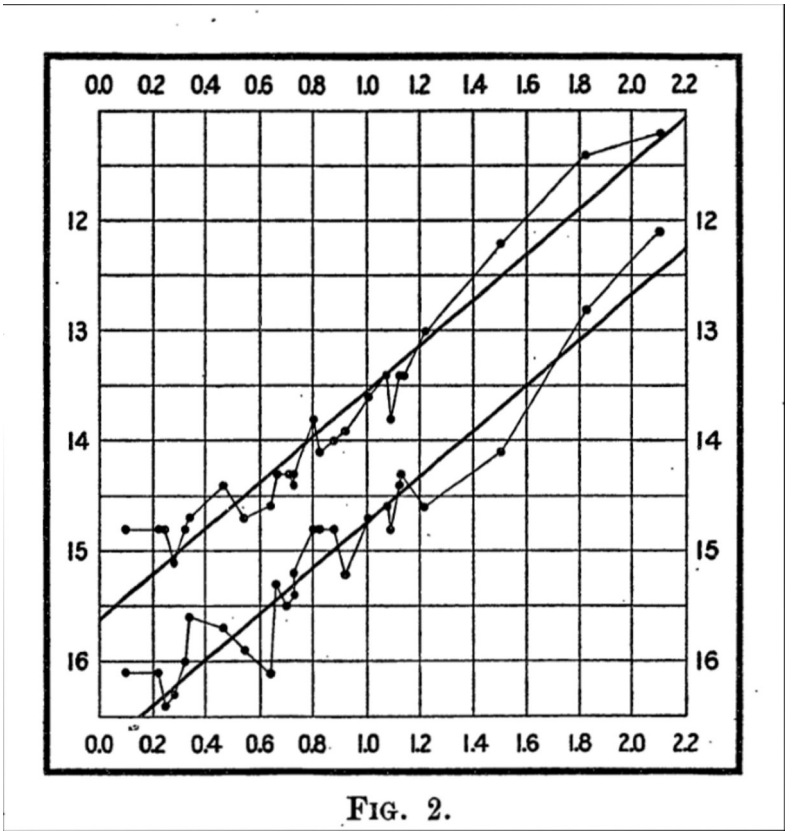

FIG. 2.

This historical diagram from Henrietta Leavitt's revolutionary publication shows the luminosity of a selection of Cepheid Variables on the vertical axis, and the log of their periods on the horizontal axis. The line drawn through these points shows how tight that relationship is between all the stars in the series. From Henrietta Leavitt and Edward Pickering's 1912 paper, "Periods of 25 Variable Stars in the Small Magellanic Cloud," a copy of which can be found at: https://ui.adsabs.harvard.edu/abs/1912HarCi.173....1L/abstract

Identification of the three craters and "extra" feature from page 9.